(3Hours)   [Total Marks :80

N.B.:—(1) Question no. 1 is **compulsory**.
     (2) Solve any **four** questions from **remaining**.
     (3) Assume necessary data wherever necessary.
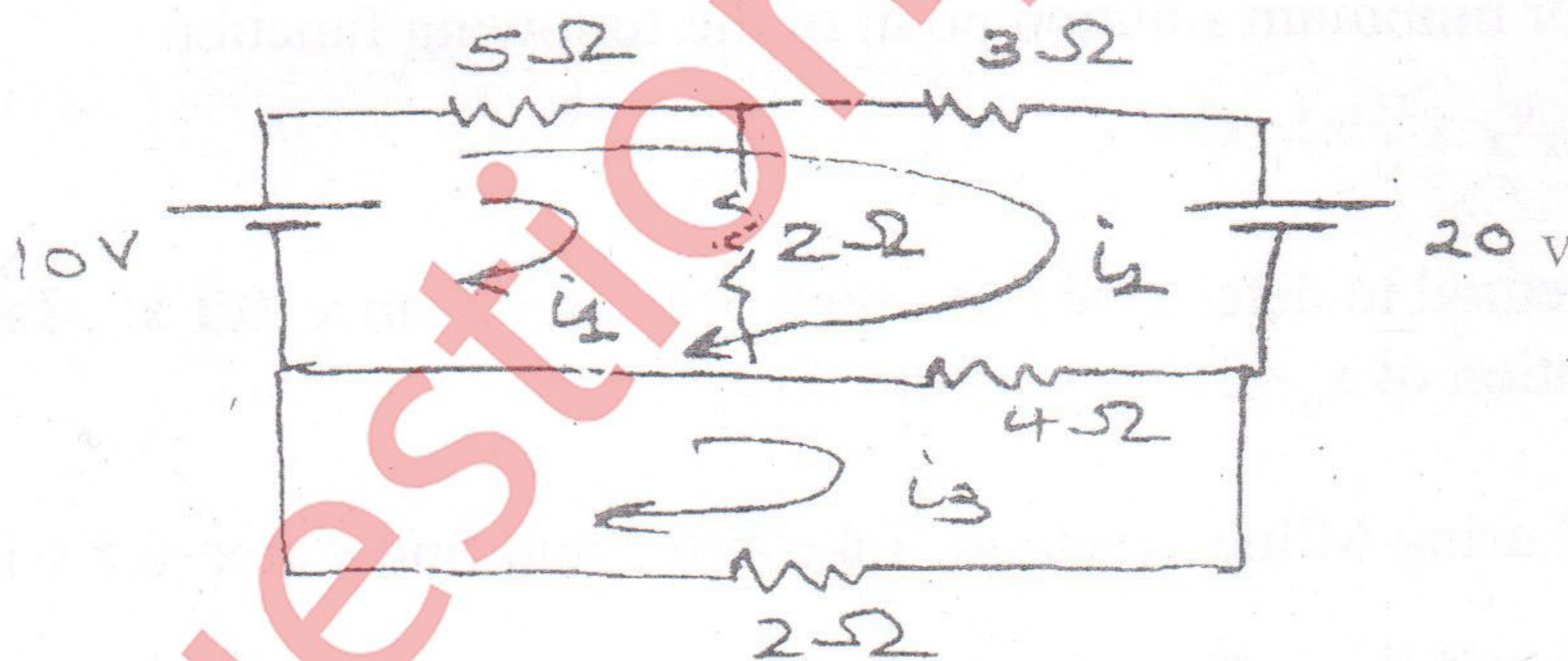
1. Each question carry 4 marks.   20
   (a) Write a short note on propagation of error.
   (b) Write an algorithm for golden section search method.
   (c) Write a short note on curve fitting with sinusoidal function.
   (d) Convert following LPP in to standard form.

$$\max Z = 3x_1 + 2x_2 + 5x_3$$

     Subjected to $2x_1 + 3x_2 - 2x_3 \leq 40$
                         $4x_1 - 2x_2 + x_3 \leq 24$
                         $x1 - 5x_2 - 6x_3 \geq 2$
                         $x_1, x_2, x_3 \geq 0$

   (e) Compare secant method with false position method.

2. (a) Use LU decomposition method to find the given currents i_1, i_2, i_3 in the following   10
     circuit.

  (b) Use method of bisection to find root of equation $f(x) = x^4 + 2x^3 - x - 1 = 0$ lying in   10
     interval [0,1] at the end of 5th iteration.

3. (a) For the following data find the polynomial $f(x)$ which passes through all the points   6
    using Newton divided difference interpolation and find value at x=4.

x	-1	0	3	6	7
f(x)	3	-6	39	822	1611

  (b) A firm produces an alloy having following specifications   4
     (i) Specific gravity ≤ 0.98
     (ii) Chromium $\geq 8\%$
   Raw materials A, B & C having properties shown in table can be used to make alloy.

Property	A	B	C
Specific gravity	0.92	0.97	1.04
Chromium	7%	13%	16%

Cost of various raw materials per ton are Rs 90 for A, Rs 280 for B, Rs 40 for C. Formulate LPP so that cost of raw materials is minimum.

(c) Solve the differential equation

$\dfrac{dy}{dx} = x^2 + 2yx$, y (0) =0 by Picard's method upto 3rd approximation   **10**

4. (a) Solve the differential equation.

$\dfrac{dy}{dx} = 1 + xz$, $\dfrac{dz}{dx} = -xy$ for x=0.3 using 4th order Runge kutta method . Given   **10**

y (0)=0, z (0) =1 , h=0.3

(b) With the given coordinates find x at y=2 using Lagrange's inverse interpolation of order 3.   **5**

x	0	1	2	3
y	0	1	7	25

(c) Find maximum or minimum solution point of the following function   **5**

$f(x) = x_1 + 2x_3 + x_2 x_3 - x_1^2 - x_2^2 - x_3^2$

5. (a) Use Newton's method to determine maximum of $f(x) = 2 \sin x - 0.1 x^2$. Take   **10**
initial approximation of $x_0 = 2.5$ & perform till $\varepsilon_s \le 1\%$

(b) Solve $\dfrac{dy}{dx} = 1 + y^2$ using Milne's method. Take h=0.2 and find y at x=0.8 with   **5**

following initial conditions. Do only one iteration.

x	0	0.2	0.4	0.6
y	0	0.2027	0.4228	0.6841

(c) Maximize $Z = 4x_1 - x_1^2 + 8x_2 - x_2^2$ **5**

Subjected to $x_1 + x_2 = 2$

$x_1, x_2 \ge 0$

using Lagrange's multiplier method.

3.

6. (a) Find maximum value using graphical method
maximize $Z = 25x_1 + 30x_2$ 10
subjected to $2x_1 + 3x_2 \leq 1500$
$3x_1 + 2x_2 \leq 1500$
$x_1 \leq 400, x_2 \leq 400$
$x_1, x_2 \geq 0$

(b) Solve using simplex method   10
Maximize $Z = 14x + 20y$
Subjected to $20x + 6y \leq 1000$
$40x + 8y \leq 500$
$x, y \geq 0$.